Remarks/Arguments:

Applicant has proposed amendments to various Figures of the drawing and various pages of the specification to correct obvious errors and informalities. Applicant further submits that the proposed amendments do not introduce new matter into the application and therefore they are proper and should be entered.

Applicant wishes to thank the Examiner for the careful attention paid to the Specification and Drawings.

Applicant has amended claim 1 to further define features of the invention that are neither taught nor suggested in the prior art, namely:

> ". . . a temperature controlling helical channel coil fixed to said outer surface of said wall said reaction vessel, said helical channel coil having at least two of flat parallel walls disposed normal to and in contact with the outer surface of said wall of said vessel, thus defining a open helical channel coil fixed to said wall said vessel, said helical channel coil having a winding pitch so that successive coils of said channel coil are spaced apart from each other, thus defining a closed path to receive fluid to contact said wall of said reaction vessel, said wall of said reaction vessel being of a thickness less than that required for use under a given temperature and pressure regime, said channel coil serving to add structural strength to said wall of said reaction vessel, . . . "
>
> ". . . means to combine vapor from said phase separator and vapor from said isothermal mixing baffle and introduce said vapor into said helical channel coil. . . ."

The Examiner has rejected claims 1-5 under 35 U.S.C. § 103 over British Patent 871752 in view of Dallmeyer et al. U.S. Patent 5,387,396.

At the outset applicant can not too strongly point out that the Examiner has fallen into the trap of using applicant's specification to not only select but to interpret the references. This is clearly contrary to existing Patent Law.

Applicant respectfully submits that nowhere in the British Reference does the Patentee disclose a helical channel coil having at least two flat parallel walls disposed normal to and in contact with the outer surface of the wall of the vessel. Furthermore, the British Patent nowhere teaches or suggests that the channel coil adds structural strength to the vessel. In point of fact, the coil 5 in the British Patent at page 2, line 49-52 is described as follows:

> "The lower part 3 is provided on its outer side with a welder pressure-resistance coil 5, for example, having a semi-tubular cross section."

The British Patent only uses a coil covering part of the outer surface of the inner vessel whereas applicants channel coil covers the entire outer vertical portion of the inner vessel. Furthermore, applicant calls the Examiners attention to the description of the vessel of the British Patent described beginning on line 51 of column 3, continuing through line 86 of page 2, to wit:

> "The space between the exterior casing and the interior reaction vessel is rendered heat insulating in accordance with the invention, for example, by means of a filling of a ceramic heat insulation material. Advantageously the space between the exterior casing and the interior reaction vessel disconnected through an automatic pressure equalizing device with a source of compressed gas in such manner that the pressure in said space is maintained approximately equal to the pressure inside the reaction vessel.
>
> The exterior pressure resistant casing may be constructed in a manner similar to that of known autoclaves. Since this casing does not come into contact with the substances taking part in the chemical reaction, it is advantageously constructed of a material well adapted to take a high pressure without having to take into account the chemical resistance of the material used for this purpose. Thus, it may be made, for example, of cast steel. The insulating material between the exterior casing reaction vessel must be so constructed that it can transmit to the exterior casing the pressure prevailing in the reaction vessel without deformation of the latter, or that, in the case of the pressure equalization described below, it offers no resistance to equalization to gas pressure within said space. Advantageously, there is used an insulation consisting of Rashing rings, Berl saddle-shaped bodies, stoneware balls or the like or a heat insulating fluid."

Applicant respectfully submits that the British Patent neither teaches nor suggests the use of an exterior channel shaped heating coil to add structural strength to the inner vessel. The British Patent relies upon the structural insulation between the inner and outer vessels to maintain the structural integrity of the inner vessel. Alternatively, the space between the inner and outer vessel can be pressurized to maintain the shape and integrity of the inner vessel – a procedure strictly prohibited by internationally accepted pressure vessel codes, including the ASME Code . This is clearly directly opposite to the teaching of applicant which relies on the helical channel coil to not only add structural strength – by increasing the area moment of inertia "I" through the use of the orthogonal coils members prescribed by Applicant - to the inner vessel but to provide additional cooling or heating of the inner vessel –by reducing the thickness of the wall through which the heat will conduct, only made possible by the aforementioned increasing of the area moment of inertia "I" . Thus, the teaching of the British Patent is directly opposite to that of the present invention. Contrary to the allegation of the Examiner, there is no teaching in the art to use the helical channel coil to add structural strength to the inner vessel. This teaching is only gleaned from applicants specification and used to interpret the teaching of the British Patent. Applicant submits that the British Patent only places the coil of a semicircular cross section on a portion of the inner vessel so that in no way the coil can be used to add structural strength to the wall of the inner vessel. The British Patent is silent as to the thickness of the inner vessel and, if thin, it must be supported by the insulation not by the coil surrounding only a portion of the inner vessel.

Applicant respectfully challenges the Examiner to show by other than mere supposition the allegation of obviousness or of what is within the ordinary skill in the art referred to in competent prior art. Competent prior art does not include applicants teaching which for the first time has disclosed the use of the helical channel coil to add structural strength to a thin wall reaction vessel.

The failure of the teaching of the British Patent is not completed by the Dallmeyer et al. reference since Dallmeyer et al. do not teach or suggest a reaction vessel having an outer helical channel coil to maintain or effect structural strength of a thin wall reaction vessel.

Furthermore, Dallmeyer et al. are inapplicable to the present invention. For example, consider a reactor configured as in Figure 1 of Dallmeyer et al. Furthermore, consider that the cooling fluid is liquid nitrogen, or any other liquid fluid who saturated temperature is below the freezing (or crystallization) point of the reaction fluid. If the boiling tubes 10 of Dallmeyer et al. are configured as shown, ice may form on this surface and heat transfer will collapse. On the other hand applicants have design uses concentric tubes to control overall heat transfer coefficient where the heat transfer coefficient inside the tubes is less (has to be, based on First Principles) than the heat transfer coefficient outside the tubes, lest ice be formed. In Dallmeyer, ice will form on the surfaces 9 and 10 to create zones of unreacted or partially reacted components, quality as well as a safety problem.

Furthermore, Dallmeyer et al. reactor is for exothermic reactions whereas Applicant's reactor can be used for either exothermic or endothermic reactions.

Dallmeyer et al. requires flow in at 4 and flow out at 6. Applicants design does not require such flow and can apply to flow in the other direction or to a batch (reactor).

Dallmeyer et al.'s use of body flanges 7, 8, 13, and 15 violates current good manufacturing practice (cGMP) criteria required by such regulatory agencies as the FDA and makes the Dallmeyer et al. reactor unusable for most pharmaceutical reaction, as well as potentially creating a very unsafe reactor.

The use of the perpendicular walls of the helical channel coils of the present invention fixed to the reactor vessel are counter intuitive and not obvious due to the fact that it would be easier to coil a half cylinder, resulting in the conventional half-pipe (semi-cross section) jacket than a rectangular channel (square or rectangular cross section) that provides the desired maximum (area moment of inertia, "I"). The design of the present invention was arrived at in order to accommodate the thermal physical properties and allow for the use of a cooling fluid that would otherwise freeze the fluid being cooled and to use the geometry of the helical channel coil to reduce heat transfer resistance.

By way of example, using the Applicant's teaching, liquid nitrogen (normal boiling point, NBP = -195°C) can be used as a cooling fluid in a reaction vessel using methanol (normal freezing point, NFP = -95°C) as a reactor working fluid; this would result in a minimum temperature driving force of 100 °C if the apparatus can be made to operate below the NFP of methanol. In the Dallmeyer et al. embodiment, methanol ice will form on the cooling surfaces in contact with the reactor fluid, thus making the temperature driving force between methanol ice and reactor fluid close to 0 °C and adding the higher conductive resistance of the methanol ice to the overall heat transfer coefficient – and conductive resistance is 1-2 orders of magnitude larger than convective film coefficients. The Applicant's teachings guarantee that only the desired convective film heat transfer coefficients will be at work.

The methanol ice will trap unreacted components, causing the overall product to be ultimately contaminated and in some cases creating hazardous conditions when the reaction fluid is ultimately warmed up.

In view of the foregoing it is respectfully submitted the rejection of claims 1-5 under 35 U.S.C. § 103(a) is not well taken and should be withdrawn.

The Examiner has rejected claims 2-3 under 35 U.S.C. § 103(a) has unpatentable over the British Patent in view of Dallmeyer et al. furthermore in view of Dean U.S. Patent 2,744,391 or Matsugi et al. U.S. Patent 5,667,758. In view of the foregoing arguments it is respectfully submitted that the British Patent and the Dallmeyer et al. Patent are fatally defective as references that teach the salient features of the invention. It is respectfully submitted that the failure of the primary reference is not made whole by either the Dean or Matsugi et al. references. Neither Dean nor Matsugi teach a helical channel coil. In both of these references the entire vessel is jacketed by a heat exchanger that is in complete contact with the outer wall of the reference. Here again, the Examiner is making suppositions about the scope of the prior art which can only be made when using applicants own teaching to not only select but to interpret the references. Therefore, it is respectfully submitted that the rejection of claims 2-3 under 35 U.S.C. § 103(a) is not well taken and should be withdrawn.

Once again, it can not be too strongly urged that the Examiner has fallen into the trap of using applicants teaching to not only select but to interpret the references, this being clearly contrary to existing Patent Law.

In view of the foregoing amendments and arguments it is respectfully submitted that the above-identified application is in condition for allowance and a notice to that effect is earnestly solicited.

Respectfully submitted,

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JCS/mc

Attachments: Figures (16 sheets)

Dated: October

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James C. Simmons

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